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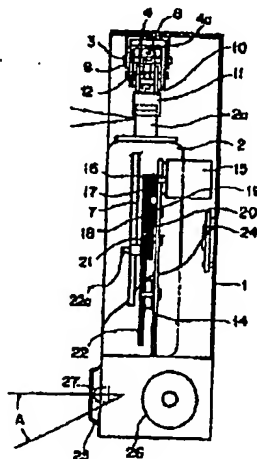
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(72) Inventors: Kato Yoshiki
Bio Chem KK, 2-19 Katamachi, Chiyoda-ku, Tokyo-to

(71) Applicant: 598118330
Bio Chem KK
2-19 Katamachi, Chiyoda-ku, Tokyo-to

(74) Agent: 100060690
Patent Attorney Hideo Takino (other 1 person)

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Detailed Description

(54) [Title of the Invention]

Automatic spraying device, controller therefor, and automatic spraying method therefor

(57) [Abstract]

[Problem to be Solved]

To provide an automatic spraying device for automatically spraying a fragrance, a deodorant, etc., into a space where the device is set-up by detecting the presence or absence of a person in the space, and to provide a controller and automatic spraying method therefor.

[Solution]

~~This automatic spraying device for spraying a fragrance, a deodorant, etc., is provided~~ with a detecting means for detecting the entry of a person into the room where the device is set up in a space and then rocking an infrared sensor 27 to probe the presence or absence of a human body in the space where the device is set up, a pressing means for pressing a spraying head 2a of a spraying vessel with a lever, a crank mechanism, etc., and a control means for detecting retreat of the person from the space by the above detecting means and operating the above pressing means to spray the fragrance, deodorant, etc., into the space. In this case, the entry into the room is detected by the infrared sensor 27 in a static state, and the infrared sensor 27 is rocked to detect the human body in the space. Accordingly, even if the space is very small, a human body can be surely detected. The retreat of the person from the space is detected by the detecting means, and then the fragrance, deodorant, etc. is sprayed with a small amount of electric power by using the lever, crank mechanism, etc.

[Patent Claims]

[Claim 1]

An automatic spraying device, characterized by the fact that this automatic spraying device for spraying a fragrance, a deodorant, etc., is provided with a detecting means for detecting the entry of a person into the room where the device is set up in a space and then rocking an infrared sensor 27 to probe the presence or absence of the human body in the space where the device is set up, a pressing means for pressing a spraying head of a spraying vessel with a lever, a crank mechanism, etc.,

and a control means for detecting retreat of the person from the room by the above detecting means and operating the above pressing means to spray the fragrance, deodorant, etc., into the space.

[Claim 2]

The automatic spraying device described under Claim 1, characterized by the fact that the above space of the set-up is a private room.

[Claim 3]

An automatic spraying device, characterized by the fact that the control apparatus of the automatic spraying device for spraying a fragrance, a deodorant, etc., is provided with a standby setting means for maintaining a standby state before the entering of a person into the room where the device is set up in a space,

an entry-detecting means for detecting the entry of a person into the room of set-up by an infrared sensor,

a driving means for rocking the above infrared sensor after detecting the entry of a person by the above detecting means,

a counting means for counting time from the point when entry into the room is detected by the above detecting means,

a room retreat detecting means for detecting retreat of the person from the room of set-up by rocking the above infrared sensor by the above driving means when time counting by the above counting means is started,

and a control means for detecting retreat of the person from the room of the set-up by the above room retreat detecting means, outputting a control signal for pressing a spraying head of a spraying vessel to spray the fragrance, deodorant, etc., and maintaining the standby state again with a spray completion signal.

[Claim 4]

An automatic spraying method of the automatic spraying device, characterized by the fact that by this automatic spraying method of automatic spraying device for spraying a fragrance, a deodorant, etc.,

entry of a person into the room of set-up is detected in a standby state of the device, then the above infrared sensor is rocked to search for the human body in the space of the set-up to detect retreat of the person from the room of the set-up, followed by spraying the fragrance, deodorant, etc.

[Detailed Description of the Invention]

[0001]

[Field of the Invention]

The present invention is related to an automatic spraying device for spraying a fragrance, a deodorant, or a disinfecting agent in a room, such as a washroom, a private room, or a karaoke box, and to a controller therefor, and an automatic spraying method therefor.

[0002]

[Prior Art]

Conventionally, there have been automatic spraying devices for detecting entry of a human body into a gate, washroom, etc. and automatically spraying a fragrance, etc. For detecting a human body, detection is based on infrared radiation or sound generated by the human body with an infrared sensor, temperature sensor, microphone, etc. The detection signal drives the driving apparatus of an automatic spraying device, operating the driving apparatus for spraying a fragrance from a spraying vessel to spray the fragrance or a deodorant.

[0003]

[Problems to be Solved by the Invention]

However, this kind of automatic spraying device is installed at doors, washrooms, etc. and there is a problem with detection with the human body detector. With this kind of human body detector, the more closely the human body is approaching, the higher is the detection sensitivity for the infrared radiation emitted by the human body. The sensitivity becomes maximum when the human body approaches the front face of the automatic spraying device. At this point the human body is detected to initiate the automatic spraying device. Accordingly, spraying liquid is sprayed towards the human body, which falls unexpectedly on the face or clothes.

[0004]

Moreover, with the human body detector using an infrared sensor, as shown in Figure 9, the infrared sensor is set up in a specific space, with a certain preset range of detection. When a human body enters this detection range, the human body detector, as shown in Figure 10(a), evaluates that a human body has entered the set-up space and emits a detection signal. Based on this detection signal, a timer is operated to count the set time T_0 and this set time T_0 is maintained in the in-room state. Then, as shown in Figure 10(b), when a human body enters the detection range and when this human body moves within the detection range, this human body detector evaluates the status as in-room state again and emits a detection signal. The set time T_0 is

counted again and maintained in the in-room state. Thus, movement of human body is detected to newly operate the timer and set up the in-room status. When the set room entry time T_0 is passed, it is evaluated as retreat of the human body from the space of set-up, resulting in the off state.

[0005]

To solve the problem with the spraying of spray liquid when a human body enters the installation space as described above, after retreat of the human body from the room, it is necessary to do something so that the fragrance, deodorant, or disinfecting agent is not sprayed from the spraying vessel directly on a human body. However, as shown in Figure 10(a), despite entry of a human body in the installation space, without movement, it might be evaluated as retreat after passage of a set time T_0 , leading to spraying of the fragrance or deodorant. There is no room for improvement.

[0006]

The present invention was pursued on the basis of the above-mentioned problems. The objective is to provide an automatic spraying device, controller therefore, and automatic spraying method therefore. The device detects entry and retreat of a human body into/from installation space of the automatic spraying device, and then automatically sprays a fragrance or deodorant, etc. into the installation space. Moreover, the objective of the present invention is to provide an automatic spraying device for automatically spraying a fragrance or deodorant, etc. with a small amount of electricity, and controller therefore, and automatic spraying method therefore.

[0007]

[Means for Solving the Problems]

The present invention has been pursued to solve the above problems. The invention of Claim 1 is related to an automatic spraying device, characterized by the fact that this automatic spraying device for spraying a fragrance, a deodorant, etc., is provided with a detecting means for detecting the entry of a person into the room where the device is set up in a space and then rocking an infrared sensor 27 to probe the presence or absence of the human body in the space where the device is set up, a pressing means for pressing a spraying head of a spraying vessel with a lever, a crank mechanism, etc., and a control means for detecting retreat of the person from the room by the above detecting means and operating the above pressing means to spray the fragrance, deodorant, etc., into the space. By this invention, the infrared sensor detects entry of a human body into the room in a static state, and then the infrared sensor is rocked to detect the human

body in the installation space. Accordingly, a human body can be surely detected even within a very small space. By this detection means, retreat of the human body from the installation space is detected, and then, with a lever, a crank mechanism, etc. the fragrance, deodorant or disinfectant is sprayed using a small amount of electricity.

[0008]

Moreover, the invention of Claim 2 is related to the automatic spraying device described under Claim 1, characterized by the fact that the above space of set-up is a private room. By this invention, retreat of the human body is surely detected in a relatively small space, and the fragrance, deodorant or disinfectant cannot be sprayed directly on the human body. Thus, it does not cause discomfort to the human body.

[0009]

In addition, the invention of Claim 3 is related to an automatic spraying device, characterized by the fact that the control apparatus of the automatic spraying device for spraying a fragrance, a deodorant, etc., is provided with a standby setting means for maintaining a standby state before the entry of a person into the room where the device is set up in a space, an entry detecting means for detecting the entry of a person into the room of set-up by an infrared sensor, a driving means for rocking the above infrared sensor after detecting the entry of a person by the above detecting means, a counting means for counting time from the point when entry into the room is detected by the above detecting means, a room retreat detecting means for detecting retreat of the person from the room of set-up by rocking the above infrared sensor by the above driving means when the time counting by the above counting means is started, and a control means for detecting retreat of the person from the room of the set-up by the above room retreat detecting means, outputting a control signal for pressing a spraying head of a spraying vessel to spray the fragrance, deodorant, etc., and maintaining the standby state again with a spray completion signal. According to this invention, there is a standby setting means. Room entry is detected by the room entry detecting means, and then the infrared sensor is rocked to detect retreat. Based on the retreat detection, the fragrance, deodorant or disinfectant is sprayed. The automatic spraying device is operated in this way to reduce electricity consumption.

[0010]

In addition, the invention of Claim 4 is related to an automatic spraying method of the automatic spraying device, characterized by the fact that by this automatic spraying method of the automatic spraying device for spraying a fragrance, a deodorant, etc., entry of a person into

the room of set-up is detected by an infrared sensor in a standby state, then the above infrared sensor is rocked to search for the human body in the space of set-up to detect retreat of the person from the room of set-up, followed by spraying the fragrance, deodorant, etc. By this invention, entry and retreat of a human body into/from an installation space, such as a private room, are detected surely, and the fragrance, deodorant or disinfectant is not sprayed directly onto the human body. Thus, the device does not cause discomfort to the person.

[0011]

[Embodiment of the Invention]

Hereafter, the embodiment of the automatic spraying device, controller therefor, and automatic spraying method therefor of the present invention is described with reference to figures. Figure 1 through Figure 3 shows one form of embodiment of the automatic spraying device of the present invention. Figure 1 shows an automatic spraying device of the present invention. It shows the front view omitting the front lid covering the main body case of the automatic spraying device. Figure 2 shows a sectional side view with a portion cut off. Figure 3 shows the configuration of a human-body-detecting apparatus and its explanation.

[0012]

The automatic spraying device of this mode of embodiment consists of a spraying vessel holding unit, a pressing unit for pressing a spraying head, an infrared sensor-based human body detecting unit, a control unit for driving the automatic spraying device, and a battery holding unit. As shown in Figure 1 and Figure 2, in the main body case 1, a spraying vessel 2 is held that contains a fragrance, a deodorant, or a disinfectant. There is a pressing unit for pressing a spraying head 2a of the spraying vessel 2. The pressing unit consists of a lever, a crank mechanism, etc. It has a pressing arm 4 equipped in a freely rockable mode on a pivot 3 that is inserted in an attached metallic-ornament 4a attached onto the upper portion of the main body case 1, a crank lever 7 that has a guide slot 6 for rocking the pressing arm 4 at a pivot 5 inserted in an attached metallic-ornament 7a that is attached onto the upper portion of the main body case 1, and a driving unit for rocking the crank lever 7.

[0013]

In the pressing arm 4, there is a long hole 4b. A pin 9 equipped on a movable pusher 10 is inserted into the long hole 4b in a loosely fitting mode. At the tip of the movable pusher 10, there is a pusher head 11 for pressing the spraying head 2a of the spraying container 2. The pin 9 is pressed down to a certain degree by a flat spring 8 attached on the pressing arm 4. The pressing force of the movable pusher 10 is adjusted with a pressure adjusting unit 12 utilizing the

elasticity of the flat spring 8. A spring 13 is connected to the power point section of the pressing arm 4, and is connected with the crank lever 7. The crank lever 7, as indicated by the arrow X, is rocked by the driving unit.

[0014]

In the driving unit, a motor 15 is attached to a maintaining substrate 14, with a drive gear 16 equipped on the revolving shaft. The driving unit is constituted so that the rotary force of the motor 15 is transmitted to a passive gear 22 by decelerating gears 17-21 from the drive gear 16. A pin (or pin with roller) 22a is equipped on the passive gear 22. The pin 22a is engaged with the guide slot 6 of the crank lever 7.

[0015]

Due to the rotation of the motor 15, the passive gear 22 rotates, leading to rotation of the pin 22a that is attached on the passive gear 22. Thus, by rocking along the guide slot 6, crank lever 7 is rocked in a direction indicated by the arrow X, thereby rocking the pressing arm 4 as indicated by the arrow Y. With the crank lever 7, the power point section of the press arm 4 is pulled downward, so that the pusher head 11 that is interlocked with the movable pusher 10 presses the spraying head 2a of the spraying container 2, leading to spraying of the fragrance, deodorant, or disinfectant from the nozzle of the spraying head 2a. When the crank lever 7 comes in contact with the lever of a microswitch 23, the microswitch 23 is turned on, outputting a spray complete signal for stopping the pressing of spraying head 2a by pressing arm 4. 24 is a control circuit part for driving the above driving unit, while 25 is a human body detecting unit and 26 is a dry battery. In the human body detecting unit 25, the infrared incidence shaft of an infrared sensor 27 is set up so that it is freely movable within a range of angle A, as shown in Figure 2. Moreover, the detection range of the human body detecting unit 25 can be rocked in a longitudinal direction at the set-up location. Naturally, the present invention is not limited to the deceleration ratio of rotation of motor described with the above mode of embodiment, nor is the deceleration mechanism limited to this mode of embodiment. Moreover, the pressing mechanism is not limited to the mechanism of lever and crank of the above mode of embodiment. It is obvious that these configurations and their combinations with others can also be used after miniaturization.

[0016]

Next, the human body detecting unit 25 is explained in details with reference to Figure 3. Figure 3(a) shows a top view of the human body detecting unit 25. Note (b) of the same figure shows a side view, while (c) of the same figure shows the scanning of the range of

detection. In Figure 3(a), the range of detection of the human body detecting unit 25 is one indicated by arrow B. An infrared sensor 27, is attached to a holding part 27a, and rotates as indicated by the arrow C around a support shaft 34. Moreover, the human body detecting unit 25 can be rotated freely in a perpendicular direction as indicated by the arrow A to be attached at a specific position.

[0017]

In the human body detecting unit 25, a motor 28 is attached to a pedestal 35. On the revolving shaft, a worm 29 is attached. A gear 30 is geared to the worm 29. A decelerating gear 30a is provided on the gear 30 on the same axle. A passive gear 31 is geared with this decelerating gear 30a. When the passive gear 31 rotates, a cam 32 rotates. The cam 32 is in contact with the holding part 27a. When the cam 32 rotates, the holding part 27a can drive, around a pivot 34, the infrared sensor 27 to scan the detection range B with its head rocking, as shown in Figure (c). Based on detecting infrared radiation from a standing human body, the ~~standing human body can be detected.~~

[0018]

Next, with reference to Figure 4 through Figure 6, the control unit of the automatic spraying device of Figure 1 is explained. For the control unit, a control means 24 consists of a logic circuit or a CPU (central processing unit). The human body detecting unit 25 and a drive unit are controlled with the control means 24. The control means 24 consists of an entry detecting means 24a that detects that a human body has entered a room where it is installed, a retreat detecting means 24b that detects that the human body has left the room where it is installed, a time counting means 24c that counts the time from entry detection, and a standby setting means 24d that maintains a standby status before entry of a human body into a room where it is installed. A motor 26 is started entry into the room is detected by the entry detecting means 24a, to rock the infrared sensor 27 for search through the range of detection. The motor 15 of the driving unit is started at the time of detection of retreat by the retreat detecting means 24b. Then, the microswitch 23 is started, completing the series of spraying action.

[0019]

Next, actuation of the automatic spraying device of this mode of embodiment is explained with reference to Figure 5. First, as shown in Figure 5(a), when entry of a human body into an installation space is detected, the sprayer is fired. The maximum spray amount over the specific installation space is pre-determined. Then, there is a period of time when the sprayer is attached (immobilized), for example, for about 15 minutes, during which the sprayer is not

fired even if entry of a human body is detected. After about 15 minutes, when entry of a human body is detected, the sprayer is fired. Alternatively, when the absence of human body in the installation space is detected, the sprayer is fired. Regarding the automatic spraying, as shown in Figure 5(b), by the control means 24, with the presence of human body in the installation space detected, for example, after a constant standby status for 20 sec, the infrared sensor searches and detects retreat of the human body from the installation space, the sprayer is fired. Thus, if a human body is not detected over 20 sec, spraying takes place. Of course, it can also be set so that the automatic spraying takes place when entry and retreat into and from installation space is detected, without setting a standby period of 15 sec.

[0020]

This automatic spraying method is explained in detail using the control flow shown in Figure 6. The control unit 25 is first set at a standby state in step S1 until entry of a human body into the installation space. In the standby state, power consumption is at the lowest level, with power supplied only to the infrared sensor 27 and the detector circuit. In step S2, when a human body enters the installation space, the detection circuit is turned on, progressing to step S3. The counting means 24c is activated, starting to count the time. The motor 28 is activated, starting the search by the infrared sensor 27, which leads to step S4. By the retreat detecting means 24b, it is evaluated if the human body has exited from the installation space or not. If retreat is detected, it leads to step S5, starting the motor 15. At step S6, by the sprayer driving means driven by the motor 15, the fragrance, deodorant or disinfectant is sprayed, leading to step S7. By the action of the microswitch 23, a spray completing signal is output, stopping the rotation of the motor 15 and hence the spraying of the fragrance, deodorant or disinfectant and returning back to step S1. This standby state can be set as until entry of a human body into the installation space. Alternatively, it can also be set so that after a certain period of time, if no entry of human body into the room is detected, it is activated and then again returned to the standby state after completion of the spraying. These set ups can be selected depending on installation space.

[0021]

Next, installation location of the automatic spraying device is explained. Figure 7 shows a side view of a location where the automatic spraying device is installed, while Figure 8 is a side view from a direction with the automatic spraying device facing the front side. An automatic spraying device D contains a spraying vessel containing a fragrance, deodorant or disinfectant, and the infrared sensor 27. It is installed, for example, as shown in Figures 7 and 8, on the wall of an installation space E with a toilet F (a so-called private room), spraying a fragrance, deodorant or disinfectant in a roughly horizontal direction. After the human body

surely has exited from the installation space E, the fragrance, deodorant or disinfectant is sprayed in a horizontal direction. Thus, there is no chance of spraying directly onto the human body. Moreover, since the fragrance, deodorant or disinfectant contains a volatile substance, the danger of fire is also eliminated, with very high safety. Furthermore, by installing this automatic spraying device in an installation space with a small group of people getting together, such as karaoke box, etc., the same effects can be fulfilled.

[0022]

Moreover, a CPU is used for the control unit of the automatic spraying device of the present invention. Usually, the CPU is operated by a control program. Depending on the installation location, the time of spraying a fragrance, deodorant or disinfectant can be adjusted by changing the control program. In addition, the control program can also be changed so that spraying is carried out periodically at a specific frequency and period.

[0023]

[Effects of the Invention]

As described above, according to the present invention, usually the installation is set in a standby state. When a human body is detected even in a small space, the retreat is detected by searching with the infrared sensor, followed by spraying a fragrance, deodorant or disinfectant. In this way, the unneeded discomfort and concerns for a human body within the installation space can be eliminated. Moreover, by this principle for pressing the spraying head of the spraying vessel, the spraying head can be pressed with a small amount of power, reducing electricity consumption. Thus, it can be operated over a long period of time with the use of a dry battery.

[Brief Description of the Figures]

[Figure 1] is a front view of a key section, showing one mode of embodiment of the automatic spraying device of the present invention.

[Figure 2] is a side view with a portion cut off, showing one mode of embodiment of the automatic spraying device of the present invention.

[Figure 3] (a) is a top view of the human body detecting unit of the automatic spraying device of the present invention, (b) is a side view and (c) is a figure showing the direction of the search.

[Figure 4] is a block diagram showing the control unit of the automatic spraying device of the present invention.

[Figure 5] is a timing chart showing the spraying operation of the automatic spraying device of the present invention.

[Figure 6] is a flow chart showing the spraying operation of the automatic spraying device of the present invention.

[Figure 7] is a side view showing an example of the use of the automatic spraying device of the present invention.

[Figure 8] is another side view showing an example of the use of the automatic spraying device of the present invention.

[Figure 9] is a figure showing an example of the conventional automatic spraying device.

[Figure 10] is a timing chart showing the spraying operation of the conventional automatic spraying device.

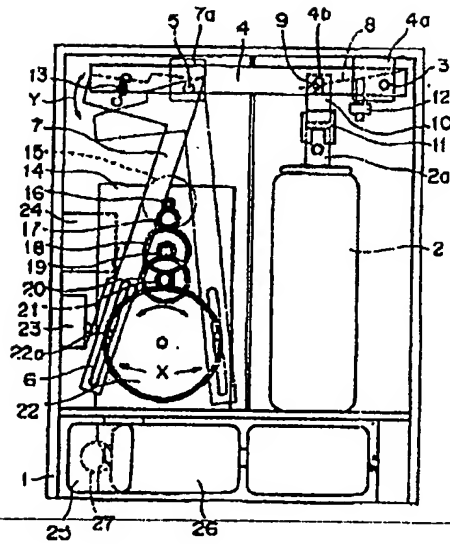
[Description of the Notations]

- 1 Main body case
- 2 Spraying container
- 2a Spraying head
- 4 Press arm
- 6 Guide slot
- 7 Crank lever
- 8 Flat spring
- 10 Movable pusher
- 11 Pusher head
- 12 Pressure control unit
- 13 Spring
- 14 Maintaining substrate

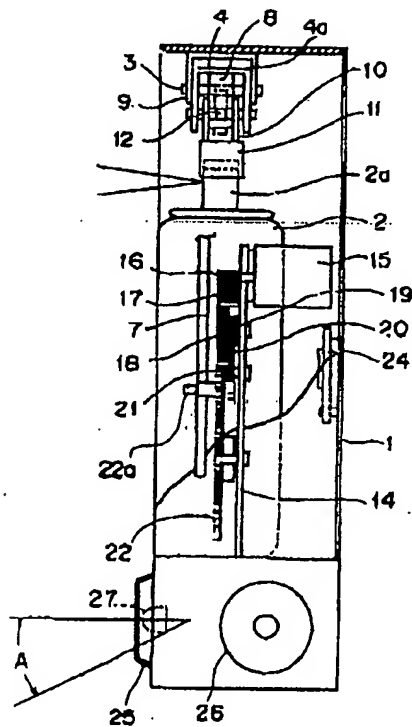
- 15 Motor
- 16 Drive gear
- 17-21 Decelerating gear
- 22 Passive gear
- 23 Microswitch
- 24 Control circuit part (control means)
- 25 Human body detecting unit
- 26 Dry battery
- 27 Infrared sensor
- 28 Motor

[Figure 9]
detection range

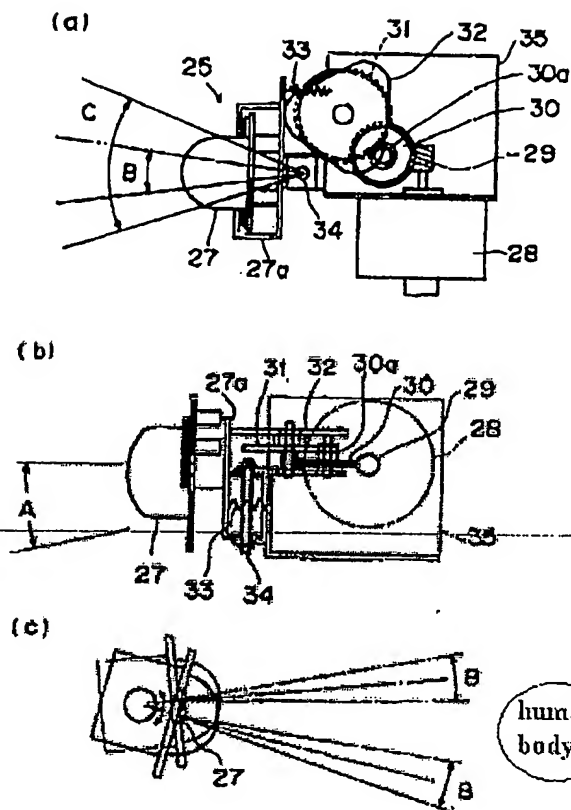
[Figure 1]



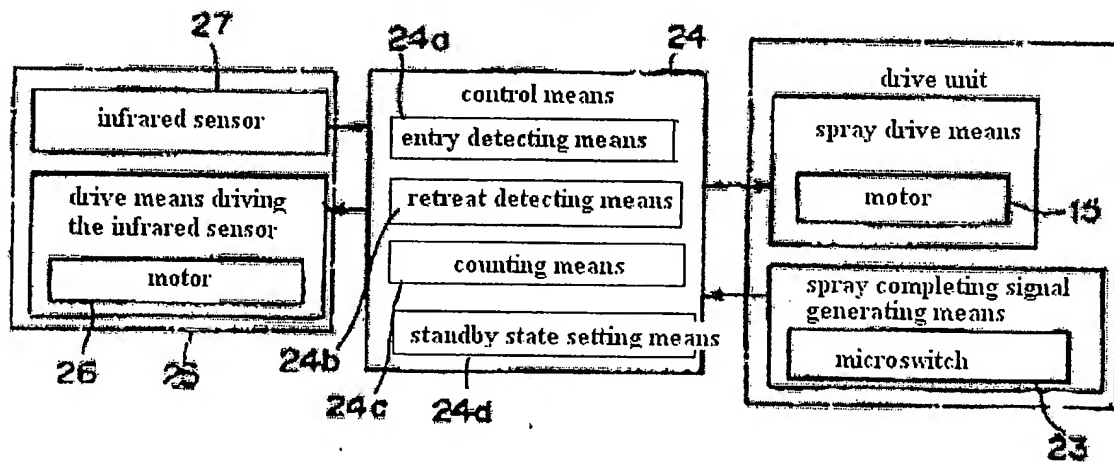
[Figure 2]



[Figure 3]

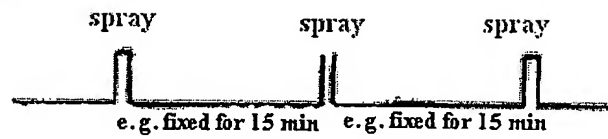


[Figure 4]

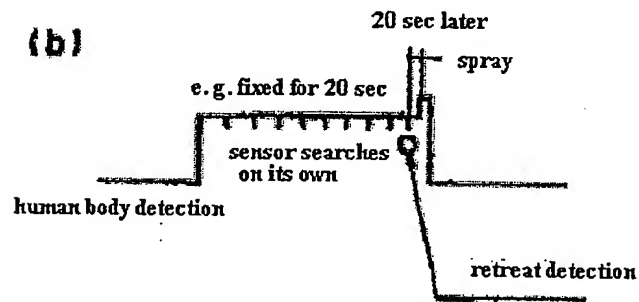


[Figure 5]

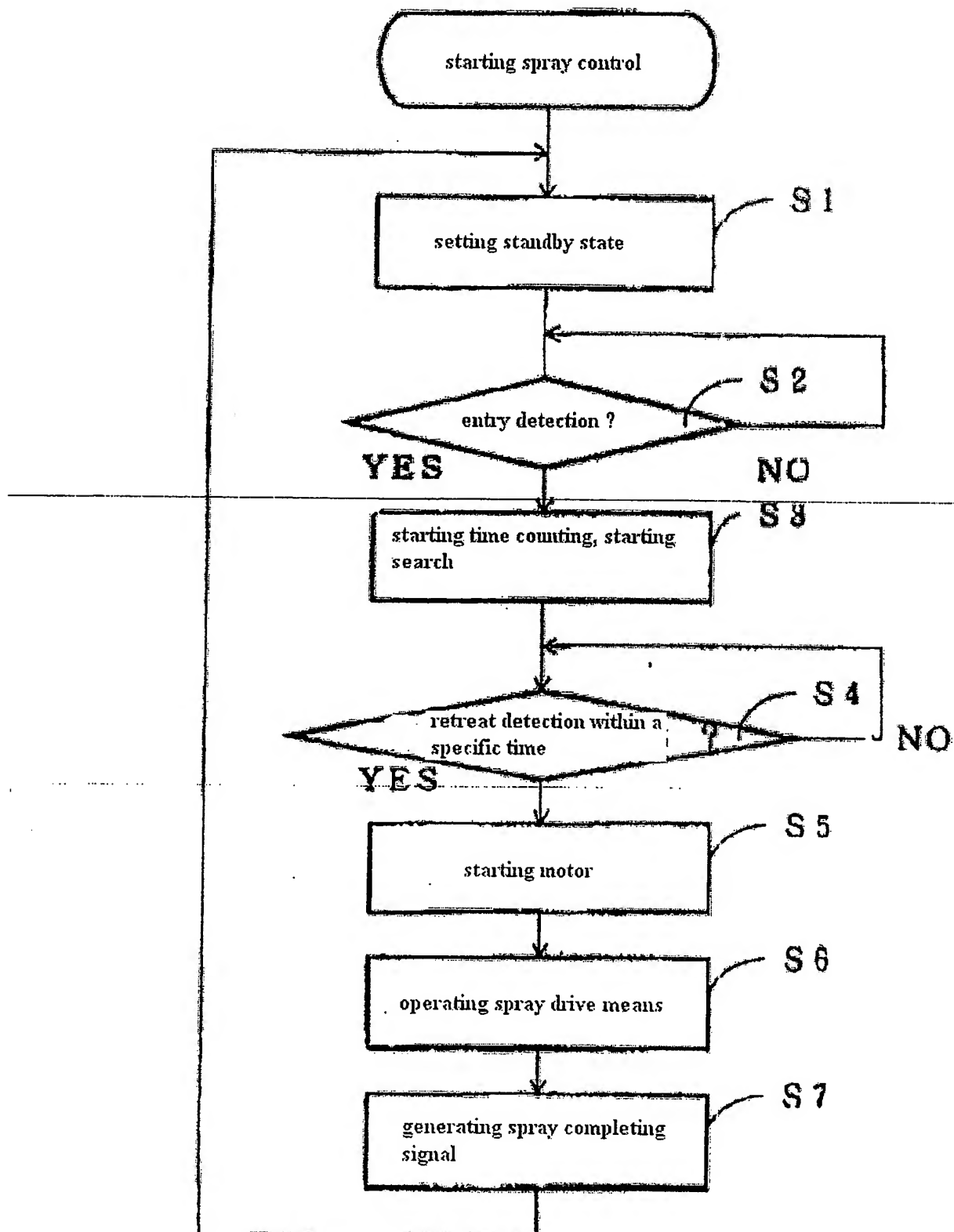
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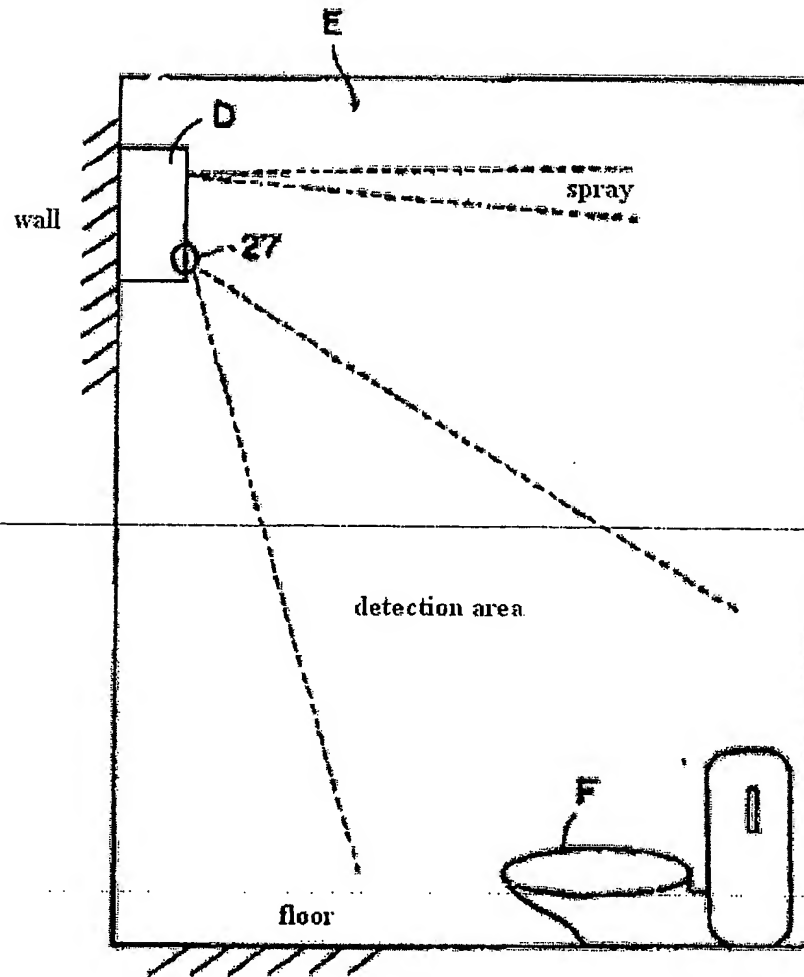
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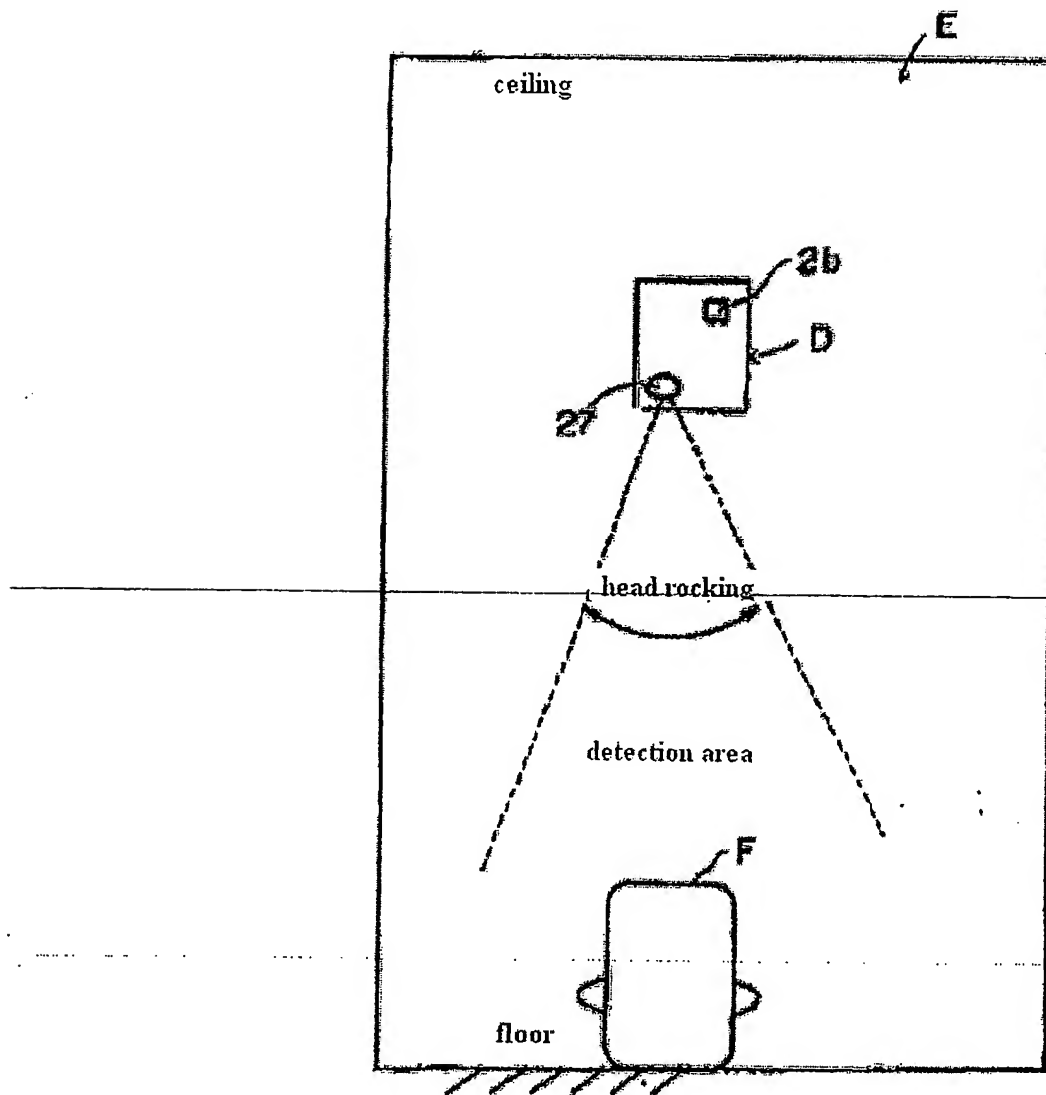
[Figure 6]



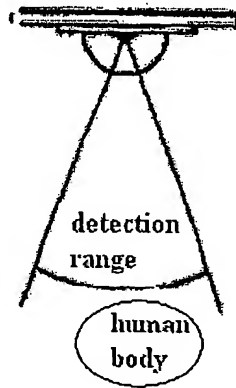
[Figure 7]



[Figure 8]

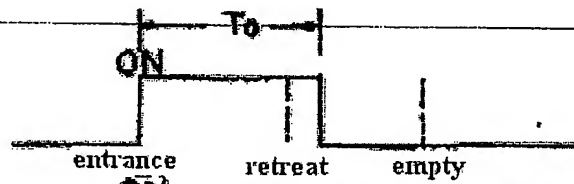


[Figure 9]

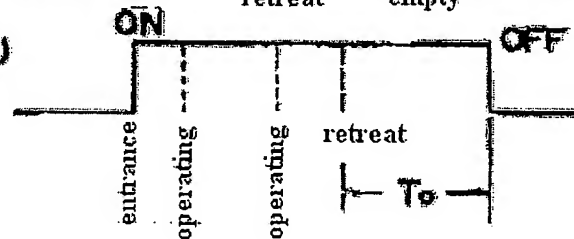


[Figure 10]

(a)



(b)



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